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File Wrapper Information

FULL CONTENTS CLAIM + DETAILED DESCRIPTION  
 TECHNICAL FIELD PRIOR ART EFFECT OF THE INVENTION  
 TECHNICAL PROBLEM MEANS OPERATION EXAMPLE  
 DESCRIPTION OF DRAWINGS DRAWINGS

[Translation done.]

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## Notes:

1. Untranslatable words are replaced with asterisks (\* \*\* \*).
2. Texts in the figures are not translated and shown as R11.

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## CLAIM + DETAILED DESCRIPTION

## [Claim(s)]

[Claim 1] It is the phase change type optical recording medium characterized by being the phase change type optical recording medium which has the recording layer which carries out a phase change reversibly by the exposure of laser light, and the protective layer of this recording layer formed in one side at least, and consisting of a constituent with which said protective layer uses Zn oxide and Si oxide as a principal component.

[Claim 2] It is the phase change type optical recording medium characterized by said constituent consisting of only a Zn oxide and a Si oxide in Claim 1.

[Claim 3] The phase change type optical recording medium characterized by the molar ratio of Zn oxide and Si oxide in said constituent being in the ranges from 8:2 to 4:6 in Claim 1 or Claim 2.

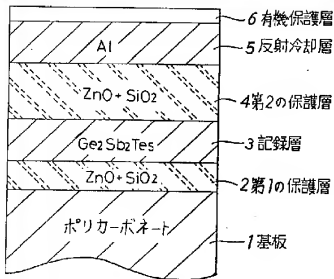
## [Detailed Description of the Invention]

[0001]

[Industrial Application] Especially this invention relates to the presentation of that protective layer about a phase change type optical recording medium.

[0002]

[Description of the Prior Art] Generally, in a phase change type optical recording medium, laser light is condensed to the recording layer of an optical recording medium, it heats even to the temperature corresponding

Drawing selection **Representative draw**

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to the pulse output and pulse width, and record and elimination of information are reversibly performed for the recording layer of the exposure part shift or by carrying out a phase change between a crystallized state and an amorphous state. And when reproducing information, a difference of the reflectance in these phase states, for example, the reflectance of a crystallized state (elimination state), reproduces information using a high thing as compared with the reflectance of an amorphous state.

[0003] The polycarbonate board 1 with which such a phase change type optical recording medium prepared many tracking slots which omitted illustration, for example as shown in [drawing 5](#), 1st protective layer [, such as ZnO on the surface, ] 2, and charge of record material, i.e., germanium2 Sb2 Te, 5 on the surface etc. -- [ recording layer / 3 ] It has the lamination structure which consists of the 2nd protective layer 4, such as ZnO on the surface, reflective cooling layers 5, such as aluminum on the surface, and organic protective layers 6, such as ultraviolet curing resin on the surface. Here, laser light is irradiated from the polycarbonate board 1 side. And the recording layer 3 is made into the crystallized state in the initial state, after irradiating laser light at this and fusing an exposure part at the time of Information Storage Division, sudden cooling is carried out and the spot of an amorphous state is formed. At the time of elimination, the annealing of the spot of this amorphous state is carried out by laser light, and it returns to a crystallized state. Moreover, a strong laser light which does not give change to the amorphous state of a record spot at the time of regeneration is irradiated, a photo detector detects the reflected light of the laser light from the spot of a crystallized state or an amorphous state, and information is reproduced.

[0004] Here, the main Reasons for having formed the 1st and 2nd protective layers 2 and 4 in the both sides of the recording layer 3 are for preventing a recording layer 3 being directly heated by the exposure of laser light, and being first, damaged by it, and are for preventing that a recording layer 3 disperses with oxidation and heating. Furthermore, the 2nd protective layer 4 makes a recording layer 3 absorb laser light efficiently, also demonstrates the ENHANSU effect which enlarges change of the reflectance of a recording layer 3, and also has the function which raises the sensitivity as a phase change type optical recording medium.

[0005] In the phase change type optical recording medium of such composition, the refractive index of ZnO used for the 1st and 2nd protective layers 2 and 4 is high, and since it is in the middle of the refractive index of the polycarbonate board 1 and a recording layer 3, laser light which entered is mostly made as for it to nonreflective conditions. Therefore, the sensitivity of a phase change type optical recording medium is good, and since record and elimination can be performed with the laser light of low power, the thermal stress which a phase change type optical recording medium receives is small.

[0006]

[Problem to be solved by the invention] However, since ZnO used for the 1st and 2nd protective layers 2 and 4 of the conventional phase change type optical recording medium has the character which is easy to crystallize, if laser light is irradiated by the degree of a repetition of record and elimination and it is heated, it will crystallize and it will tend to generate volume change and a stress. That is, since thermal stability is low, the problem that that exfoliation or surface unevenness arises etc.

has the low reliability of a phase change type optical recording medium is in the 1st and 2nd protective layers 2 and 4.

[0007] Furthermore, although an oxide (Ta<sub>2</sub>O<sub>5</sub>, TiO<sub>2</sub>, SiO<sub>2</sub>, and aluminum<sub>2</sub>O<sub>3</sub>), a nitride (AlN and Si<sub>3</sub>N<sub>4</sub>), a chalcogen ghost (ZnS), etc. can be used for the 1st and 2nd protective layers 2 and 4 besides ZnO. Since neither of the material is the material with which it is satisfied of any characteristics of a refractive index and thermal stability, they has been hindrance raising the reliability of a phase change type optical recording medium.

[0008] In view of the above problem, there is a technical problem of this invention in using for a protective layer the material which improved a refractive index and thermal stability, and realizing a reliable phase change type optical recording medium.

[0009]

[Means for solving problem] [ the means provided in the phase change type optical recording medium of this invention ] in order to solve the above-mentioned technical problem It is preparing the recording layer which carries out a phase change reversibly by the exposure of laser light, and the protective layer of this recording layer formed in one side at least, and using for a protective layer the constituent which uses Zn oxide and Si oxide as a principal component, or the constituent which consists of only a Zn oxide and a Si oxide.

[0010] In this invention, in order to raise most effectively the reliability of a phase change type optical recording medium, it is desirable to make into the ranges from 8:2 to 4:6 the molar ratio of Zn oxide and Si oxide in the constituent which constitutes a protective layer.

[0011]

[Function] In the phase change type optical recording medium concerning this invention, Si oxide has high thermal stability to Zn oxide having a high refractive index among the composition components of the constituent which constitutes a protective layer. Therefore, the constituent which uses these oxides as a principal component, or the constituent which consisted of only these oxides has a comparatively high refractive index, and its thermal stability is also comparatively high. So, since laser light which entered will be mostly made to nonreflective conditions if this constituent is used for the protective layer of a phase change type optical recording medium, the sensitivity of a phase change type optical recording medium is good, and laser power required for record and elimination is low. That is, the thermal stress which a phase change type optical recording medium receives in all at the time of record and elimination is small. Since the refractive index of Si oxide is low as compared with the refractive index of Zn oxide, here [ the refractive index of this constituent ] If it compares with the refractive index of a single presentation of Zn oxide, it is low, but it is not what increases greatly laser power required for record of a phase change type optical recording medium, and elimination. It is more effective for raising the reliability of a phase change type optical recording medium by blending Si oxide that thermal stability improves than the influence. Thus, since both the refractive index of a protective layer and thermal stability are optimized among the elements which specify the reliability of a phase change type optical recording medium, the reliability of a phase change type optical recording medium can be improved.

[0012]

[Working example] Based on an accompanying drawing, the phase change type optical recording medium concerning the work example of

this invention is explained hereafter.

[0013] Drawing 1 is the sectional view showing typically the structure of the phase change type optical recording medium of this example. Here, the same sign is given to the portion which has the same function as the conventional phase change type optical recording medium.

[0014] The polycarbonate board 1 this phase change type optical recording medium of whose is 3.5 inches in which the tracking slot (not shown) of 1.6-micrometer pitch was formed, ZnO and SiO<sub>2</sub> whose thickness by which weld slag formation was carried out on this surface is 125nm The 1st protective layer 2 which consists of a constituent, germanium<sub>2</sub> Sb<sub>2</sub> Te<sub>5</sub> whose thickness by which weld slag formation was carried out on this surface is 20nm Recording layer 3, ZnO and SiO<sub>2</sub> whose thickness by which weld slag formation was carried out on this surface is 10nm The 2nd protective layer 4 which consists of a constituent, It is the structure where have the aluminium alloy slack reflective cooling layer 5 whose thickness formed on this surface is 100nm, and the organic protective layer 6 of ultraviolet curing resin whose thickness formed on this surface is 10 micrometers, and these were laminated one by one.

[0015] The point that the phase change type optical recording medium of this example differs from the former is in the material composition of the 1st and 2nd protective layers 2 and 4. That is, in the phase change type optical recording medium of this example, they are the 1st and 2nd protective layers 2 and 4 ZnO and SiO<sub>2</sub> It constitutes from a constituent. Here, RF magnetron sputtering equipment is used for the 1st and 2nd protective layers 2 and 4, and they are ZnO and SiO<sub>2</sub>. Weld slag membrane formation is carried out from the target which carried out mixed sintering.

[0016] In addition, the presentation of the 1st and 2nd protective layers 2 and 4 is ZnO and SiO<sub>2</sub> of a target. It is possible by changing the mixing ratio to set up arbitrarily. Here, sputtering gases is Ar and O<sub>2</sub>. Mixed gas was used.

[0017] ZnO and SiO<sub>2</sub> of the constituent used for below at the 1st and 2nd protective layers 2 and 4 Composition ratio is changed and the result of having evaluated laser power required for the thermal stability, a refractive index, record, and elimination and the number of times of repeatable of record and elimination is explained one by one.

[0018] [Relation of the presentation and thermal stability of a constituent] It is ZnO and SiO<sub>2</sub> first. Change composition ratio and a class product is formed. germanium<sub>2</sub> Sb<sub>2</sub> Te<sub>5</sub> which are the component of a recording layer about it After heating at 700 degrees C which is a temperature higher than a fusing point, it cools and the result of having investigated the crystal structure after heating is shown in Table 1 using X-ray diffractometer. incidentally -- before heat-treatment -- the composition ratio of ZnO -- 100mol % -- except the single presentation of ZnO except that is, a crystal peak is accepted in no composition ratios, but it is checked that it has been amorphous.

[0019]

[Table 1]

ZnO : SiO <sub>2</sub> (mol%)	X線回折結果
100 : 0	六方晶
90 : 10	六方晶
80 : 20	非結晶
60 : 40	非結晶
20 : 80	非結晶
0 : 100	非結晶

[0020] Thus, when the composition ratio of ZnO was more than 90 mol %, the hexagonal structure of ZnO was accepted in the constituent after heating, and having shifted namely, crystallized from the amorphous state to the crystallized state with heating which is 700 degrees C was checked. When these layers were observed using SEM, unevenness had actually produced the surface of the crystallized layer, but the surface of the other layer was still smooth. Therefore, when the composition ratio of ZnO is more than 90 mol %, it is assumed that it is easy to generate the volume change and the stress by crystallization. On the other hand, when the composition ratio of ZnO is less than 80 mol %, a crystal peak is not accepted, even after heating at 700 degrees C. From this, it is SiO<sub>2</sub>. It turns out that crystallization of ZnO by heating is barred by mixing to ZnO, and it is effective in increasing the thermal stability of a constituent. Therefore, since it is hard to produce thermal change even if the exposure of laser light receives thermal stress when the composition ratio of ZnO uses the constituent not more than 80 mol % as a protective layer of a phase change type optical recording medium, it is thought to a repetition of record and elimination that it is stable.

[0021] [Relation of the presentation and refractive index of a constituent] In drawing 2, it is ZnO and SiO<sub>2</sub>. The relation between composition ratio and the refractive index in the wavelength of 830nm is shown. A refractive index also falls almost linearly from 2.0 to 1.5 as the composition ratio of ZnO decreases from this from 100mol % to 0mol %, and it is SiO<sub>2</sub>. It turns out that addition brings about decline in a refractive index. Here, in the 1st protective layer 2, if the refractive index is close to the middle of the polycarbonate board 1 and a recording layer 3, laser light which entered is mostly made to nonreflective conditions, and the sensitivity as a phase change type optical recording medium is

high. Therefore, in the range of the refractive index shown in [drawing 2](#) , it is so desirable that the value is large.

[0022] [Relation between the presentation of a constituent, and laser power required for record and elimination] ZnO and SiO<sub>2</sub> in the phase change type optical recording medium which used the constituent for protective layers 2 and 4 The relation between composition ratio and laser power required for record and elimination is shown. In [drawing 3](#) , it is ZnO and SiO<sub>2</sub>. Here, laser power required for record and elimination rotates a phase change type optical recording medium by 9.0 m/s, and measures by performing record and elimination with laser light with a wavelength of 830nm, a solid line (a) shows laser power required for record, and a solid line (b) shows laser power required for elimination. In this figure, it is 20mW at 20mol% of case to the laser power which any laser power which record and elimination take is increasing, so that the composition ratio of ZnO decreases, for example, record takes when the composition ratio of ZnO is more than 80 mol % being 16mW. Similarly, in the case of not more than 20 mol %, the laser power which elimination takes is 12mW to being 8mW, when the composition ratio of ZnO is 90% or more.

[0023] When the composition ratio of ZnO decreases, this is that a refractive index becomes low and is because the sensitivity of the phase change type optical recording medium fell, as it was checked by previous evaluation. However, SiO<sub>2</sub> Although the tendency to increase laser power required for record and elimination has addition, the influence is small as compared with the influence to which a refractive index is reduced.

[0024] [Relation between the presentation of a constituent, and the number of times of repeatable of record and elimination] In [drawing 4](#) , it is ZnO and SiO<sub>2</sub>. The relation between composition ratio and the number of times of repeatable of record of the phase change type optical recording medium which used it for protective layers 2 and 4, and elimination is shown. Here, while repeating laser light, irradiating it to the phase change type optical recording medium and repeating record and elimination, the CN ratio (carrier-to-noise ratio) for every regeneration and the elimination ratio which is the rate of change of a CN ratio were measured, and the number of times when a CN ratio or an elimination ratio falling by 3dB was made into the number of times of repeatable. As a result, although laser power required for record and elimination is small since the refractive index is high when the composition ratio of ZnO is 100mol %, the number of times of repeatable is 104. It is a cycle and the reliability as a phase change type optical recording medium is low. Moreover, SiO<sub>2</sub> Although thermal stability is high when composition ratio is 100mol %, since laser power required for record and elimination is large, the number of times of repeatable is 103. It is a cycle and the reliability as a phase change type optical recording medium is low. On the other hand, ZnO and SiO<sub>2</sub> when a constituent is used for an overcoat When the number of times of repeatable of a phase change type optical recording medium is improving and especially the composition ratio of ZnO uses 40mol% of a constituent for a protective layer from 80mol %, the number of times of repeatable is 106. Becoming a cycle was checked.

[0025] The above thing to protective layers are ZnO and SiO<sub>2</sub>. in consisting of a constituent A refractive index is comparatively large, and since laser power required for record and elimination is small and ends, even if it receives the thermal stress by repetition of record and

elimination, it is hard to produce volume change and a stress, and hard to generate exfoliation, surface unevenness, etc. in a protective layer, since there are few thermal burdens and the thermal stability of burden is also comparatively high. Therefore, the number of times of repeatable of record and elimination improves, and the reliability as a phase change type optical recording medium improves. It is ZnO and SiO<sub>2</sub> in particular. When a molar ratio uses the protective layer which are the presentations from 8:2 to 4:6, thermal stability and a refractive index can be optimized and it becomes possible to make the number of times of repeatable of record and elimination into 106 or more cycles.

[0026] in addition -- in this example -- ZnO and SiO<sub>2</sub> from -- although the becoming constituent was used, you may be the case where an inescapable component lives together -- moreover, Zn and Si -- ZnO and SiO<sub>2</sub> You may live together as another oxidation state, for example, peroxide etc. Furthermore, even if it is the case where the 3rd component is added, it is ZnO and SiO<sub>2</sub>. If it is a principal component, it can be assumed that the effect is demonstrated.

[0027]

[Effect of the Invention] In the phase change type optical recording medium concerning this invention, it has the feature as above to use the constituent which uses Zn oxide and Si oxide as a principal component at the protective layer, or the constituent which consists only of a Zn oxide and a Si oxide. Therefore, according to this invention, while Zn oxide has a high refractive index, it does so the effect that it can raise the reliability of a phase change type optical recording medium by making the refractive index and thermal stability of a protective layer into a proper level since Si oxide has high thermal stability.

[0028] When a presentation with Zn oxide and Si oxide is especially made into the ranges from 8:2 to 4:6 by a molar ratio, the effect of raising reliability is remarkable.

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[Report Mistranslation](#)

[Japanese \(whole document in PDF\)](#)